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ABSTRACT

This study examined the extent to which selected high school academic variables and noncognitive characteristics of American College Testing (ACT)--tested students explain differential test performance of racial/ethnic and gender groups. Of particular interest was the extent to which the noncognitive variables, over and above course work taken, grades earned, and high school attended, reduce racial/ethnic or gender differences in mean ACT scores. The sample for the study included 5,489 ACT-tested students from 106 high schools who completed a survey about their perceptions of themselves, their homes, and their school environment. Using stepwise multiple regression, from 34% to 59% of the variance in ACT scores could be explained by the high school academic variables (high school grade average, core mathematics and science courses taken) and high school attended. Students' noncognitive characteristics (education-related factors, time spent on selected activities, background characteristics, and students' perceptions of themselves) explained about 15% additional variance in ACT scores, over and above grade average and course work taken. Race/ethnicity or gender explained only 1% to 2% of additional variance, over and above the other variables considered. Additional analyses revealed differences between African American and Caucasian American students in the types of variables most strongly related to their ACT scores. Two appendixes contain a survey of ACT-tested students and weighted descriptive statistics for all variables in the full models. (Contains 6 tables, 3 figures, and 17 references.) (Author/SLD)

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Abstract

This study examined the extent to which selected high school academic variables and noncognitive characteristics of ACT-tested students explain differential test performance of racial/ethnic and gender groups. Of particular interest was the extent to which the noncognitive variables, over and above course work taken, grades earned, and high school attended, reduce racial/ethnic or gender differences in mean ACT scores. The sample for the study included 5,489 ACT-tested students from 106 high schools who completed a survey about their perceptions of themselves, their homes, and their school environment.

Using stepwise multiple regression, from 34% to 59% of the variance in ACT scores could be explained by the high school academic variables (high school grade average, core mathematics and science courses taken) and high school attended. Students' noncognitive characteristics (education-related factors, time spent on selected activities, background characteristics, and students' perceptions of themselves) explained about 15% additional variance in ACT scores, over and above grade average and course work taken. Race/ethnicity or gender explained only 1% to 2% of additional variance, over and above the other variables considered.

Additional analyses revealed differences between African American and Caucasian American students in the types of variables most strongly related to their ACT scores.

High School Academic and Noncognitive Variables Related to the ACT Scores of Racial/Ethnic and Gender Groups

Introduction

In recent years, standardized tests have been closely scrutinized with regard to the impact of their use on various population subgroups. College admissions tests like the ACT Assessment and the Scholastic Assessment Test (SAT) have been criticized for "biased" assessment of women and African Americans, in particular (e.g., FairTest Examiner, Fall 1994; Lederman, 1998; Rooney, 1998). Because these tests are used to make admissions and course placement decisions, and because score differences could have implications for the educational opportunities of selected population subgroups, it is important to determine what factors appear to influence score differences.

In studying ethnic and gender differences on the ACT Assessment, researchers have examined the relative impact of course work taken, grades earned, student and high school characteristics, educational plans, and high school attended on test performance (e.g., Noble, Crouse, Sawyer, & Gillespie, 1992; Noble & McNabb, 1989; Chambers, 1988). Their findings suggested that differential performance on these tests was, to a large extent, the result of differences in the type and quality of academic preparation, regardless of race/ethnicity or gender. Statistically controlling for courses taken, grades earned, and high school attended, race/ethnicity or gender, though statistically significant for most ACT tests, accounted for no more than 1% to 2% of additional variance in ACT scores (Noble, et al., 1992).

Many studies have examined the relationships between selected noncognitive characteristics of students and educational achievement. Noncognitive characteristics such as family background (Chubb & Moe, 1990; Honan, 1996); academic behavior and attitudes, high school preparation, and valuing of education (Stricker, Rock, & Burton, 1992); students' self-concept and self-efficacy beliefs

(Hamacheck, 1995; Schunk, 1991); work and homework (Viadero, 1998); and school support of students (Wehlage, 1991) were associated with student achievement. Noble and McNabb (1989) found that family income, size of graduating class, the percentage of students of similar race to the students in the school, enrollment in a college-preparatory curriculum, race/ethnicity, and gender were related to ACT performance, over and above the variance explained by courses taken and grades earned. Noble, Crouse, Sawyer, and Gillespie (1992) found that expected college freshman GPA, family income, and needs for help with reading and mathematics skills explained 5% to 8% of additional variance in ACT scores, over and above course work taken, grades earned, and high school attended.

The predictor variables in the Noble, et al. (1992) study explained 39% to 64% of the variance in ACT scores, leaving 36% to 61% of the variance unexplained. They concluded that additional noncognitive variables should be examined; their study was limited to only those variables provided by students at the time they register for the ACT Assessment. The other studies on racial/ethnic and gender differences in test scores also focussed on a limited number of student characteristics, and did not include a comprehensive array of noncognitive characteristics of students, such as their background characteristics; time spent on activities; and attitudes and perceptions, either about themselves, their families, or their schoolteachers, counselors, or administrators. The purpose of this study, therefore, was to determine the extent to which a broad spectrum of noncognitive characteristics would explain differential ACT performance of racial/ethnic and gender groups, over and above high school grades, courses taken, and high school attended.

Data for the Study

Data Collection and Sample

A sample of students was identified from the populations of high school juniors and seniors who registered for the ACT Assessment in either April 1996 (n = 444,776) or October 1996 (n = 404,978).

Two test dates were used because April ACT-tested students are typically juniors and October ACT-tested students are typically seniors. Including students from both test dates would provide a more representative sample of the entire ACT-tested population.

It was determined that a sample size of 6000 students (3000 per test date) would achieve a reasonable level of precision; 9096 students were identified for the two test dates (approximately 5000 per test date) to allow for attrition (from ACT registration to testing) and for survey nonresponse. Sampling was done by school. Stratification variables included school size (based on the number of students registered for each test date), and geographic region. All students tested within a school were included in the sample. However, only schools from which at least 60 students registered for the April or the October ACT test dates were included. The typical number of students per school registering for the ACT Assessment was 60; smaller schools were eliminated to increase the likelihood of sufficient numbers of students from different racial/ethnic groups within each school.

Four weeks after the ACT Assessment was administered, students in the sample were sent a questionnaire designed to collect information about their behavior and attitudes in several noncognitive areas. Two weeks after the initial mailing, postcards were sent to respondents; a second copy of the questionnaire was mailed to respondents after one month. Of the original sample, 5,489 students from 106 schools completed and returned the questionnaire, for a response rate of 60%.

In order for the sample to represent the population from which it was selected, weights were applied to the data collected. The weights were calculated as follows:

$$W_{hi} = \frac{N_h}{n_h} * \frac{M_{hi}}{m_{hi}} * K,$$

where: h = the stratum to which the school belongs,

i = school,

N_h = the number of schools, in the population, from stratum h,

n_h = the number of schools, in the sample, from stratum h,

M_{hi} = the number of students in the 1996 ACT-tested high school graduating class from school i in stratum h,

m_{hi} = the number of students in the sample from school i in stratum h, and

K = constant to make the weighted sample size equal to that of a simple random sample of equal precision.

K was included to simplify calculations of statistical significance levels used to select independent variables for modeling ACT scores (see Methods section).

The resulting weighted sample differed somewhat from ACT-tested students nationwide (ACT, 1996). The weighted mean ACT Composite score (22.2) and high school grade average (3.30) for the sample were higher than those for the entire 1996 ACT-tested high school graduating class (20.9 and 3.14, respectively). Although there was a higher percentage of females (62%) in the sample than in the entire ACT-tested high school graduating class (56%), the distributions of race/ethnicity and region were similar for the two groups.

To adjust for the differences in mean ACT Composite score, the sample was reweighted to reflect the distribution of ACT Composite scores of 1996 ACT-tested high school graduates nationwide. New weights were calculated as follows:

$$W'_{hi} = W_{hi} * \frac{PF(x)}{SF(x)} * \frac{\sum_{y} SF(y)}{\sum_{y} PF(y)},$$

where: x = ACT score

PF = population frequency at score x,

SF = sample frequency at score x, and

$\sum_{y} SF(y)$ and $\sum_{y} PF(y)$ are the total frequencies for the sample and population, respectively.

All analyses were conducted using weighted data. The total reweighted sample size was 1738.

Data for this study were taken from two sources: the ACT Assessment and a questionnaire developed to collect information about student attitudes and behaviors. The dependent variables for the study were the four ACT scores (in English, Mathematics, Reading, and Science Reasoning) and the Composite. Information about the grouping and coding of all of the independent variables is provided in Table 1. A copy of the survey is provided in Appendix A. For a complete discussion of all of the ACT Assessment and survey variables, see ACT Research Report 99-4.

Gender and race/ethnicity variables were obtained from the ACT Student Profile Section. Racial/ethnic groups in the study included African American, Caucasian American, Hispanic/Native American, Asian American and Other ethnic group. Due to small sample sizes, Mexican-American/Chicano, Puerto Rican/Cuban/Other Hispanic, and American Indian/Alaskan Native students were combined into a Hispanic/Native American category. Gender and race/ethnicity were dummy-coded, as shown in Table 1, to allow for the comparison of ACT scores between groups: Females were compared to males, and African Americans, Hispanics/Native Americans, Asian Americans and Other ethnic groups were compared to Caucasian Americans.

Method

Weighted descriptive statistics were calculated for all independent and dependent variables. Weighted zero-order correlations were also calculated between all independent variables and ACT scores. Independent variables that were not statistically significant ($p > .01$), or that were statistically significant but did not correlate at least .10 with ACT scores, were excluded from further analyses.

TABLE 1

Description of Independent Variables and Order of Entry into Regression Models

Variables within blocks	Description	Coding
High school academic variables		
1: High school grade average in 4 core areas	Average of course grades in 23 core courses in English, mathematics, natural sciences, and social studies	0.0 to 4.0
2: Courses taken/taking		
English (5 courses)	English 9, English 10, English 11, English 12, and Speech	Yes = 1; no = 0
Mathematics (7 courses)	Algebra 1, Algebra 2, Geometry, Trig., Calculus, Other math beyond Algebra 2, and Computer Math/Computer Science	Yes = 1; no = 0
Natural Sciences (4 courses)	General Physical/Earth Science, Biology, Chemistry, Physics	Yes = 1; no = 0
Social Studies (7 courses)	U.S. History, World History, Other History, Civics, Economics, Geography, Psychology	Yes = 1; no = 0
Noncognitive variables		
3: Education-related Factors		
College-prep. curr.	Student is participating in a college-preparatory curriculum	Yes = 1; no = 0
	Student reported needing help with	
Need help with mathematics skills	improving math skills.	Yes = 1; no = 0
Need help with reading comprehension and reading speed	improving reading comprehension and reading speed skills.	Yes = 1; no = 0
Need help with study skills	improving study skills.	Yes = 1; no = 0
Need help with writing skills	improving writing skills.	Yes = 1; no = 0
Need help with personal issues	personal issues.	Yes = 1; no = 0
Need help with educational plans	educational planning.	Yes = 1; no = 0
Reason for attending college		
Academic	E.g., to increase knowledge and skills, learn about other cultures, etc.	Yes = 1; no = 0
Social	E.g., to join a fraternity or sorority, to develop social skills, etc.	Yes = 1; no = 0
Negative	E.g., to get away from parents, can't find anything else to do after high school.	Yes = 1; no = 0
4: Activities		
	Average number of hours per week spent	0 hours/Does not apply = 0,
Educational Activities	participating in education-related activities.	1 - 5 hours = 1,
Social activities	participating in social activities.	6 - 10 hours = 2,
	Number of hours per week spent	11 – 15 hours = 3
Homework	working on schoolwork at home.	16 - 20 hours = 4,
Work	working at a job for pay.	More than 20 hours = 5
Extracurricular activities	participating in extracurricular activities.	
Watching TV	watching television.	

Table 1 (Continued)

Variables within blocks	Description	Coding
Noncognitive variables (cont.)		
5: Background variables		
Family income	Estimated, pre-tax parental income range.	1 - 10: ($18k or less = 1; increasing in increments of about $8k up to $100k
Negative home situations	Number of negative situations in the home (e.g., a recent divorce, health problems, etc.)	0 – 10
Parents' education	Average level of education of both parents or guardians.	Less than HS diploma or GED = 1; HS diploma or GED = 2; Some college, no degree = 3; Voc.-tech diploma or cert. = 4; Associate's degree = 5; Bachelor's degree = 6; Master's degree = 7; Doctoral or Professional degree = 8
Language	English is the predominant language spoken in the home.	Yes = 1; no = 0
Number of children in the home	Number of children in the home (age 20 or less)	
Number of adults in the home	Number of adults living in the home (age 21 or over)	
6: Perceptions of school		
Teachers	Perceptions about the supportiveness of the teachers in the student's school.	Strongly disagree = 1, …Strongly agree = 5;
Counselors	Perceptions about the helpfulness of the counselors in the student's school.	Does not apply = missing
7: Perceptions of home and friends		
Parents	Perceptions about the support and involvement of parents in the student's education.	Strongly disagree = 1, … Strongly agree = 5; Does not apply = missing
Friends	Perceptions about friends' encouragement to succeed in school.	
Pressure to participate in athletics	Pressure from parents to participate in organized school athletics.	
8: Perceptions of self		
Self-confidence	Perception of self-confidence for succeeding in academic activities.	Strongly disagree = 1, … Strongly agree = 5; Does not apply = missing
Healthy lifestyle	Participation in activities that promote a healthy lifestyle (e.g., exercise, proper diet).	
School value	Sense of value placed on school and school related activities.	
Positive attributions	Perception that academic success is related to high ability; failure to lack of effort.	
General anxiety	A pervasive sense of worry and anxiety about personal safety and security.	
9: High school attended	105 effect-coded dummy variables, each representing a particular high school in the sample.	Member of a particular high school = 1; all other high schools except the last = 0; last high school = -1
10: Gender or ethnicity	Females, males, African Americans, Caucasian Americans, Hispanics/Native Americans, Asian Americans, Other.	Females = 1; Males = 0 Hispanics include Puerto Rican/Cuban/Other Hispanic, Mexican American/Chicano, and American Indian/Alaskan Native. Member of a particular group = 1; all other groups = 0

Stepwise multiple regression was then used (SAS Version 6 (1989)) to model the five ACT test scores (English, Mathematics, Reading, Science Reasoning and Composite) as a function of cognitive and noncognitive variables. Variable blocks 1 through 8 were entered into each model one at a time and in the order described in Table 1. This approach would show the contribution of noncognitive variables, race/ethnicity, and gender to explaining ACT score performance, over and above high school course work taken and grades earned. Of course, other variable orderings are possible; however, this ordering was used to consider first those variables over which students have some control. All regression analyses were based on weighted data (weighted sample size = 1738).

In order to be retained in the models, variables within the blocks were required to be statistically significant ($p < .01$) and noncollinear (multicollinearity was identified using condition indices of 15 or greater and common variance proportions greater than .50, as described in Belsley, Kuh, & Welch, 1980). Upon entry, each variable block was evaluated relative to the blocks preceding it; this procedure continued until all of the blocks were entered. Moreover, independent variables that previously met the entry criteria were assessed again at the entry of each additional block. Those variables that no longer met the criteria were removed from the model. (Note that this procedure differs from traditional blockwise selection.)

Each regression model was developed separately. Independent variables were allowed to differ across ACT score models, resulting in slightly different sample sizes for each regression model. Weighted descriptive statistics and zero-order correlations between ACT scores and the independent variables that met the criteria are presented in Appendix B.

The high school attended and gender or race/ethnicity (Blocks 9 and 10) were added and retained in all models regardless of their statistical significance. However, statistical significance ($p < .05$) was

noted for gender and race/ethnicity. High school attended was entered late in the models because it is a variable over which students have little or no control, as are gender and race/ethnicity.

The activities variables (Block 4) were also examined to determine whether their relationships with ACT scores were nonlinear. Both linear and quadratic terms for these variables were included in the models; the quadratic terms were retained in those models when the criteria for inclusion were met.

Unadjusted and adjusted mean differences were calculated by gender and race/ethnicity. Females were compared to males, and African Americans, Hispanics/Native Americans, Asian Americans and Other ethnic groups were compared to Caucasian Americans. Adjusted mean differences corresponded to the regression coefficients for each racial/ethnic and gender group, given the other variables in the models. Unadjusted mean differences corresponded to the regression coefficients from regression models that included only the racial/ethnic or gender dummy variables.

Results

Descriptive Statistics

Table 2 contains weighted descriptive statistics for each ACT test score. Means and standard deviations are given for the total sample and for each gender and racial/ethnic group. These statistics are based on the students with valid information for all variables used in the final regression models.

Unweighted sample sizes for the total group ranged from 3,849 (Composite) to 3,928 (English); some students did not complete one or more ACT tests. Approximately 64% of the total group was female and 82% was Caucasian American. Differences in mean ACT test scores between males and females were found for Mathematics (1.4 scale score units), Science Reasoning (1.5 scales score units), and the Composite (.7 scale score units), with males having the higher means.

Mean ACT scores also differed across racial/ethnic groups. For example, Asian Americans typically scored about 1.0 scale score units lower than Caucasian Americans on the English and Reading

tests, but scored 2.1 scale score units higher than Caucasian Americans on the Mathematics test. African American, Hispanic/Native American, and Other racial/ethnic group students generally scored lower than Caucasian American and Asian American students. Mean score differences between African American and Caucasian Americans ranged from 4.5 scale score units for Science Reasoning to 5.3 scale score units for Reading; mean ACT scores for Hispanics/Native Americans were 1.4 to 2.0 scale score units lower than those for Caucasian Americans.

TABLE 2

Weighted Descriptive Statistics for ACT Test Scores by Gender and Ethnic Group
(Unweighted Sample Size)

	English		Mathematics		Reading		Science Reasoning		Composite	
Group	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Total	20.7 (3928)	5.28	20.8 (3864)	4.89	21.2 (3924)	5.87	21.2 (3857)	4.44	21.1 (3849)	4.56
Male	20.5 (1394)	5.26	21.7 (1372)	5.25	21.2 (1392)	6.12	22.2 (1373)	4.82	21.6 (1368)	4.84
Female	20.8 (2534)	5.29	20.3 (2492)	4.61	21.2 (2532)	5.73	20.7 (2484)	4.12	20.9 (2481)	4.39
African American	16.4 (283)	4.52	16.5 (270)	3.42	16.6 (283)	4.89	17.3 (271)	3.18	16.8 (269)	3.42
Caucasian American	21.4 (3121)	5.07	21.3 (3076)	4.71	21.9 (3117)	5.64	21.8 (3069)	4.30	21.7 (3070)	4.36
Hispanic/ Nat. Amer.	19.4 (168)	5.17	19.9 (160)	4.82	20.5 (168)	6.24	20.0 (161)	4.42	20.2 (159)	4.63
Asian American	20.4 (133)	5.43	23.4 (135)	5.08	20.8 (133)	6.08	21.6 (134)	4.06	21.7 (133)	4.45
Other	19.4 (98)	5.20	20.4 (96)	4.68	19.8 (98)	5.73	20.3 (95)	3.90	20.1 (96)	4.28

Note: Sample sizes for each group and test are shown in parentheses. Due to missing data, the sum of the sample sizes for the racial/ethnic groups may not equal that of the total sample.

Mean score differences for gender and ethnic groups were similar in direction to those for the 1996 ACT-tested graduating class. However, for this sample, mean score differences between Caucasian American and African American students were larger than those nationally, and mean differences between Hispanic/Native American students and Caucasian American students were smaller. Differences in mean scores for Caucasian American and Asian Americans were similar to those

nationally. Mean gender differences were slightly larger for the sample for Mathematics, Science Reasoning, and the Composite, and slightly smaller for English and Reading.

Regression Analyses-Full Models

Gender. Table 3 and Figure 1 show the results of the final regression models developed for gender. As shown in Figure 1, the total amount of variance explained across all five ACT scores ranged from 47% (Reading) to 66% (Mathematics); standard errors ranged from 1.59 (Composite) to 2.45 (Reading). High school grade average and core courses taken accounted for the greatest proportion of explained variance in all five ACT test scores (R^2 = .29 to .53). These two blocks alone comprised 62% (Reading) to 80% (Mathematics) of the total variance explained by the gender models.

FIGURE 1. **Variance in ACT Assessment Scores Attributable to High School Course Work Variables, Noncognitive Variables, High School Attended, and Gender**

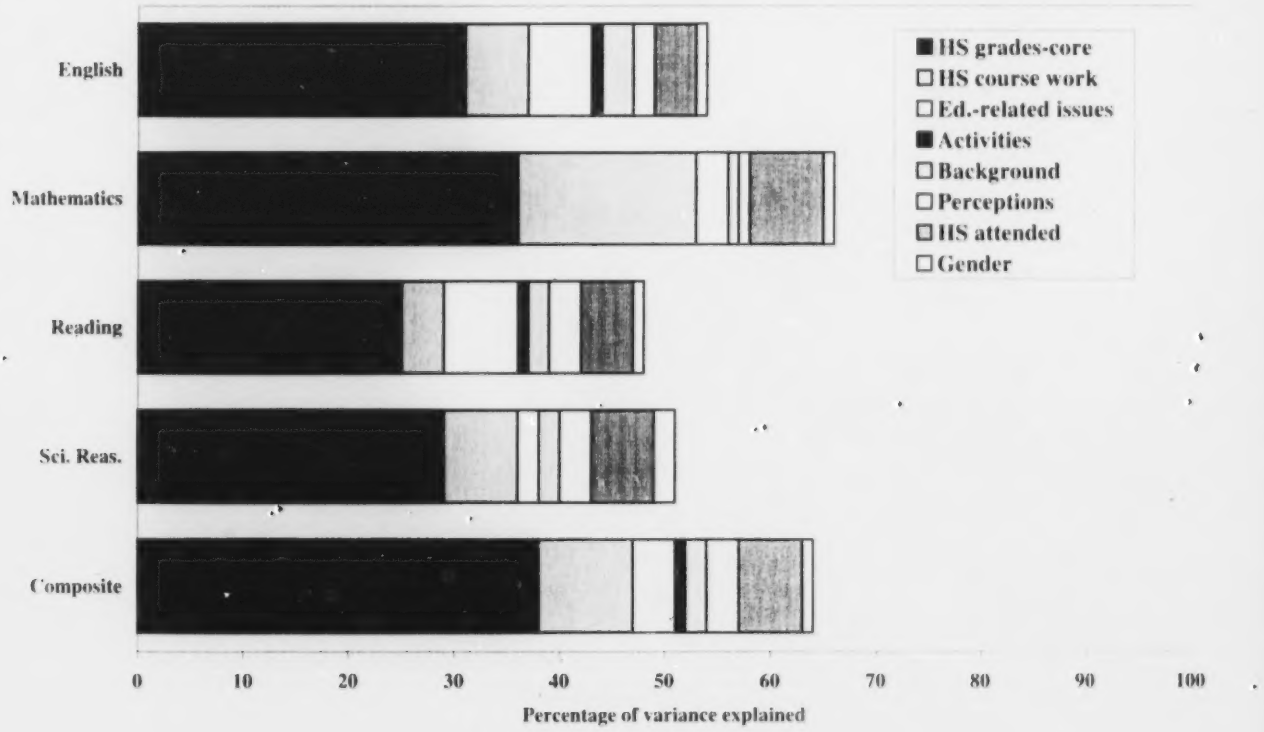

TABLE 3

Weighted Regression Statistics for All Independent Variables and All ACT Tests: Gender

Block/independent variables	English (unweighted n = 3928)		Mathematics (unweighted n = 3864)		Reading (unweighted n = 3924)		Science Reasoning (unweighted n = 3857)		Composite (unweighted n = 3849)	
	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2
Intercept	5.10		9.25		8.64		10.49		8.04	
1: High school grade average in 4 core areas	3.22	.31	2.81	.36	3.23	.25	2.68	.29	3.01	.38
2: Core courses taken (1=yes, 0=no)		.06		.17		.04		.07		.09
Algebra 2	.88		.95		.94		--		.85	
Geometry	1.38		1.15		--		.93		.80	
Trigonometry	1.27		1.96		1.10		1.08		1.37	
Calculus	2.09		3.38		2.28		1.68		2.33	
Other math beyond Alg. 2	.51		1.27		.71		.58		.77	
Chemistry	--		--		--		.84		--	
Physics	--		.89		--		.64		.61	
3: Education-related factors		.06		.03		.07		.02		.04
College-prep. curriculum (1=yes, 0=no)	1.14		.44		1.06		.58		.80	
Need help with math skills (0=yes, 1=no)			-1.32		--		--		--	
Need help with reading (0=yes, 1=no)	-1.67		--		-2.65		-1.18		-1.39	
Need help with writing skills (0=yes, 1=no)	-.78		--		--		--		-.30	
4: Activities (hours per week, 0-5)		<.01		--		.01		--		<.01
Educational activities	1.57		--		2.44		--		1.16	
Quadratic term	-.49		--		-.65		--		-.32	
Homework	--		--		-1.12		--		--	
Quadratic term	--		--		.18		--		--	
5: Background variables		.03		.01		.02		.02		.02
Parents' level of education (1-8)	.29		.18		.29		.18		.22	
Primary language at home is English (1=yes; 0=no)	1.93		--		1.90		1.17		1.22	
8: Perception variables (1-5)		.02		.01		.03		.03		.03
Perception of self										
General anxiety	-.75		-.37		-1.02		-.53		-.67	
9: High school attended		.04		.07		.05		.06		.06
10: Gender (1=female, 0=male)	.36	<.01	-1.11	.01	.08*	<.01	-1.50	.02	-.57	<.01
Total R^2	.52		.66		.47		.52		.63	
SEE	2.09		1.62		2.45		1.76		1.59	

Notes: Unstandardized regression coefficients for all achievement and noncognitive variables were statistically significant ($p < .01$). Regression coefficients for gender were statistically significant ($p < .05$) unless marked with an asterisk.
Regression coefficients for all variables in Blocks 6 and 7 were not statistically significant ($p > .01$).
The sum of the values in the R^2 columns may not equal the corresponding total R^2 due to rounding error.
See Table 1 for variable coding.

High school grade average contributed substantially to the variance explained by the high school course work blocks. However, of the 23 courses entered into the model, only mathematics, chemistry, and physics courses accounted for a statistically significant proportion of the variance in any of the ACT scores. This is not to say that other course work taken, including English and social studies courses, were unrelated to ACT performance. In general, the other courses taken were collinear with mathematics and science courses, or they were either mostly taken or not taken by these students.

Individual unstandardized regression coefficients can be interpreted as the average change (increase or decrease) in ACT scores associated with a one-unit change in an independent variable, given the other variables in the model. For example, as shown in Table 3, taking trigonometry was associated with average ACT score increases of more than 1.0 scale score units for all ACT tests. Over and above the other variables in the models, taking a calculus course was associated with average ACT score increases of more than 2.0 scale score units for all ACT tests except Science Reasoning (1.68). Taking chemistry was statistically significant ($p < .01$) only for Science Reasoning; taking physics was statistically significantly related to Mathematics, Science Reasoning, and the Composite.

The four noncognitive variable blocks (Blocks 3, 4, 5, and 8) together accounted for between 5% (Mathematics) and 13% (Reading) of the variance in ACT scores, over and above the variance accounted for by the other variables in the models. Much of this was due to the contribution of the education-related factors block (Block 3). None of the variables in Blocks 6 or 7 met the criteria for inclusion in the final models.

Enrollment in a college-preparatory curriculum, and needing help with mathematics skills, reading skills, or writing skills were related to ACT performance, but the relationships varied by ACT test. For example, being enrolled in a college-preparatory curriculum was associated with mean ACT

scale score differences of 1.14 for English and 1.06 for Reading. However, corresponding mean differences for Mathematics and Science Reasoning were less pronounced (.44 and .58, respectively).

Students indicating needs for help with mathematics skills, reading skills, or writing skills had lower scores, on average, than those not needing help, given the other variables in the models. Students who indicated a need for help with reading scored more than 1.0 scale score units lower, on average, than those who did not need help. Needing help with mathematics skills was associated with a decrease of 1.32 scale score units for Mathematics only. Needing help with writing skills was associated with a decrease in English and Composite scores of less than 1 scale score unit.

Hours spent on educational activities and hours spent on homework were the only activity variables that met the criteria for inclusion in any of the gender models, over and above the other independent variables in the models. Of special interest was the fact that these relationships were not linear: Though the relationship between ACT scores and educational activities was moderately positive for students spending 0 to 10 hours per week on educational activities, ACT scores tended to decline for students spending more than 10 hours on educational activities. Overall, the relationship between ACT Reading scores and hours spent each week on homework was negative, with the least effect occurring for 0 hours and 20 or more hours. Further examination showed that many high and low-scoring students indicated that they spent 0 hours per week studying.

The family background variables (parents' level of education and primary language in the home is English) explained only 1% to 3% of the variance in ACT scores, over and above the other variables in the models. Each increment of parents' level of education was associated with ACT test score increases of .18 to .29 scale score units. The use of English as the primary language in the home was associated with relatively large mean score increases of 1.17 to 1.93 for all ACT tests except Mathematics.

Noticeably absent from the block of background variables was family income, which shared a moderate zero-order correlation with ACT test scores. However, family income proved to be highly collinear with several other independent variables, including high school grade average, parents' level of education, and the number of negative situations in the home. Moreover, a substantial number of students did not report their family income. These factors resulted in its exclusion from both the gender and the race/ethnicity models.

Perceived general anxiety was the only perception variable that appeared related to ACT performance, over and above the other variables in the models. For example, each increment in the level of perceived anxiety (e.g., agree to strongly agree) was associated, on average, with a 1.02 scale score unit decrease in Reading scores. Perceived anxiety alone accounted for 3% of the variance in Reading, Science Reasoning and Composite scores, over and above the other variables in the models.

High school attended (Block 9) accounted for 4% to 7% of the variance in ACT scores, over and above the other variables in the models.

After accounting for high school grades and course work, education-related factors, activities, background, perceptions, and high school attended, gender (Block 10) accounted for a small but statistically significant ($p < .05$) proportion of the remaining variance in ACT Mathematics and Science Reasoning scores (1% and 2%, respectively). Gender accounted for less than 1% of the variance in all other ACT scores, and was not statistically significant ($p > .05$) for Reading.

Race/ethnicity. The race/ethnicity results are reported in Table 4 and Figure 2. The total amount of variance accounted for by the models ranged from 48% (Reading) to 66% (Mathematics; see Figure 2). As with the gender models, the majority of the explained variance in ACT scores was associated with the high school grade average and course work variables (Blocks 1 and 2). High school grade average and courses taken accounted for 29% to 53% of the variance in ACT scores (60% to 80% of the

explained variance). Unlike the gender models, however, need for help with writing skills (Block 3) was not included for the Composite model, and need for help with mathematics skills was included for the Science Reasoning model.

The five race/ethnicity models were very similar to the gender models with regard to relationships between ACT scores and other independent variables. However, over and above the other variables in the model, race/ethnicity explained no more than 1% of the variance in ACT scores.

FIGURE 2. **Variance in ACT Assessment Scores Attributable to High School Course Work Variables, Noncognitive Variables, High School Attended, and Race/Ethnicity**

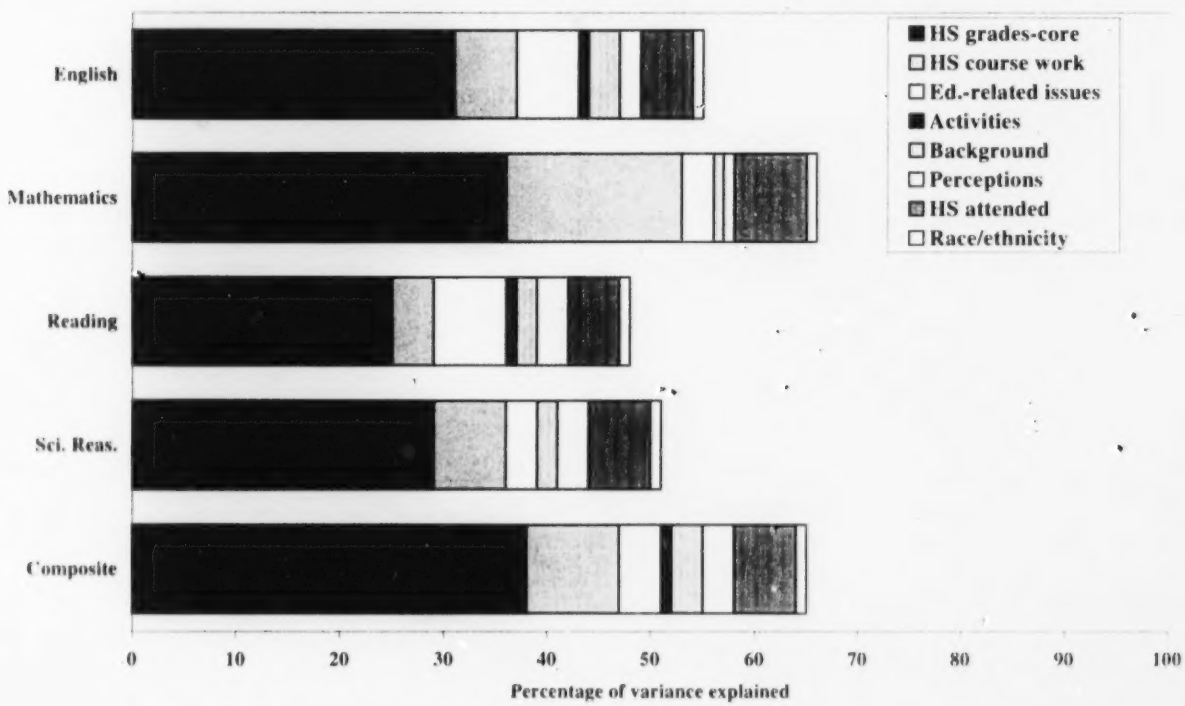

TABLE 4

Weighted Regression Statistics for All Independent Variables and All ACT Tests: Race/Ethnicity

Block/independent variable	English (unweighted n = 3803)		Mathematics (unweighted n = 3737)		Reading (unweighted n = 3799)		Science Reasoning (unweighted n = 3730)		Composite (unweighted n = 3727)	
	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2	Regression coefficient	Increase in R^2
Intercept	5.70		9.85		9.00		11.36		8.42	
1: High school grade average in 4 core areas	3.15	.31	2.52	.36	3.11	.25	2.31	.29	2.83	.38
2: Core courses taken (1=yes, 0=no)		.06		.17		.04		.07		.09
Algebra 2	.85		1.02		.77		--		.83	
Geometry	1.31		1.01		--		.82		.69	
Trigonometry	1.30		1.94		1.18		1.07		1.39	
Calculus	2.00		3.38		2.20		1.75		2.34	
Other math beyond Alg. 2	.50		1.23		.72		.52		.75	
Chemistry	--		--		--		.79		--	
Physics	--		.99		--		.79		.67	
3: Education-related factors		.06		.03		.07		.03		.04
College-prep. curriculum (1=yes, 0=no)	1.17		.50		1.08		.63		.84	
Need help with math skills (0=yes; 1=no)	--		-1.42		--		-.36		--	
Need help with reading (0=yes; 1=no)	-1.69		--		-2.60		-.97		-1.40	
Need help with writing skills (0=yes; 1=no)	-.62		--		--		--		--	
4: Activities (hours per week; 0-5)		<.01		--		.01		--		<.01
Educational activities	1.70		--		2.52		--		1.11	
Quadratic term	-.53		--		-.66		--		-.28	
Homework	--		--		-1.11		--		--	
Quadratic term	--		--		.18		--		--	
5: Background variables		.03		.01		.02		.02		.03
Parents' level of education (1-8)	.26		.18		.27		.20		.22	
Primary language at home is English (1=yes, 0=no)	1.97		--		2.24		1.06		1.35	
7 & 8: Perception variables (1-5)		.02		.01		.03		.03		.03
Perception of self										
General anxiety	-.70		-.47		-.99		-.65		-.73	
9: High school attended		.05		.07		.05		.06		.06
10: Ethnicity		.01		.01		.01		.01		.01
Afr. Am. (1) Vs Cauc. Am. (0)	-1.90		-1.49		-2.22		-1.54		-1.81	
Hispanic/ Native American (1) vs. Cauc. Am. (0)	-.68		-.80		-.18*		-.80		-.57	
Asian Am. (1) vs. Cauc. Am. (0)	-.71*		.54		-.76*		-.49*		-.28*	
Other (1) vs. Cauc. Am. (0)	-.91		-.42*		-1.02		-.91		-.85	
Total R^2	.53		.66		.48		.50		.64	
SEE	2.07		1.63		2.42		1.78		1.57	

Note: Regression coefficients for all achievement and noncognitive variables were statistically significant ($p < .01$). Regression coefficients for race/ethnicity were statistically significant ($p < .05$) unless marked with an asterisk.
Regression coefficients for all variables in Blocks 6 and 7 were not statistically significant ($p > .01$).
The sum of the values in the R^2 columns may not equal the corresponding total R^2 due to rounding error.
See Table 1 for variable coding.

Unadjusted and Adjusted Mean Differences

Unadjusted and adjusted mean ACT score differences between males and females are shown in Table 5. Unadjusted mean Mathematics, Science Reasoning and Composite scores of females were statistically significantly ($p < .05$) lower than those of males. However, when adjusted for the variables in the models, these mean differences were reduced by 20%, 2%, and 14%, respectively.

TABLE 5

Weighted Unadjusted and Adjusted ACT Score Mean Differences by Gender and Race/Ethnicity

Group	Type	Mean difference from Caucasian Americans/males				
		English	Mathematics	Reading	Science Reasoning	Composite
Females	Unadj.	.27	-1.39	.00	-1.53	-.66
	Adj.	.36	-1.11	.08	-1.50	-.57
Afr. Am	Unadj.	-4.95	-4.80	-5.33	-4.55	-4.91
	Adj.	-1.90	-1.49	-2.22	-1.54	-1.81
Hispanic/ Nat. Amer.	Unadj.	-1.98	-1.31	-1.43	-1.80	-1.54
	Adj.	-0.68	-0.80	-0.18	-0.80	-0.57
Asian Am.	Unadj.	-1.00	2.18	-1.12	-0.17	-0.01
	Adj.	-0.71	0.54	-1.02	-0.49	-0.28
Other	Unadj.	-2.02	-.87	-2.17	-1.51	-1.60
	Adj.	-0.91	-0.42	-0.76	-0.91	-0.85

Unadjusted and adjusted mean ACT score differences by race/ethnicity are presented in the lower portion of Table 5. Unadjusted mean ACT score differences were greatest between African Americans and Caucasian Americans; mean differences between Caucasian Americans

and Hispanics/Native Americans or Other ethnic group were considerably smaller. On average, Asian Americans scored higher than did Caucasian Americans for Mathematics.

Statistically controlling for the variables in the models resulted in substantial reductions in mean score differences among the racial/ethnic groups: Mean score differences between African Americans and Caucasian Americans were reduced by 58% (Reading) to 69% (Mathematics), and mean differences between Hispanics/Native Americans and Caucasian Americans were reduced by 39% (Mathematics) to 87% (Reading). Mean ACT score differences between the Other ethnic group and Caucasian Americans were reduced by 40% (Science Reasoning) to 55% (English). Although Asian Americans had an unadjusted mean Mathematics score more than 2.0 scale score units higher than that of Caucasian Americans, this difference was reduced by 75% when adjusted for the variables in the regression model. However, adjusting for the variables in the regression models increased mean Science Reasoning and Composite score differences between Asian Americans and Caucasian Americans. Note, however, that the regression coefficients for Asian Americans for these two tests were not statistically significant ($p > .05$).

Regression Analysis by Racial /Ethnic Group

Additional regression models were developed to further explain differences in ACT performance by racial/ethnic and gender groups. For this analysis, regression models for explaining ACT scores were developed within racial/ethnic group. Gender was included as an independent variable in these models. Due to relatively small weighted sample sizes for Hispanics/Native Americans and Asian Americans, models were developed only for African American and Caucasian American students. Statistical significance levels of $p < .05$ and $p < .01$ were used for the African American and Caucasian American models, respectively. High school

attended was excluded from the models, due to the relatively small sample size for African Americans.

The results of the analysis are shown in Table 6. For African American students, R^2 values ranged from .35 to .57, with SEEs ranging from 1.58 to 2.63. In comparison, R^2 values ranged from .39 to .58 for Caucasian Americans, with SEEs ranging from 1.63 to 2.44. A greater proportion of variance in English and Composite scores was explained for African American students than for Caucasian American students; a smaller proportion of the variance in Mathematics and Science Reasoning scores was explained for African American students than for Caucasian American students. For both groups, however, the variables that contributed the most to explaining ACT scores for both groups were high school grade averages and course work taken.

The differences in the total variance explained for these two racial/ethnic groups were, for the most part, attributable to the differences in the contributions of high school grade average, course work taken, education-related factors, and perception variables. For example, high school grade average and core courses taken explained a greater proportion of the variance in ACT English and Composite scores for African American students, compared to Caucasian American students. The opposite was true for Mathematics and Science Reasoning. Moreover, for English and Composite scores, the perception variables explained a slightly greater proportion of additional variance for African Americans than for Caucasian Americans.

TABLE 6

Weighted Regression Statistics for All Independent Variables and All ACT Tests by Racial/Ethnic Group

	English				Mathematics				Reading				Science Reasoning				Composite			
	Afr. Am (n = 286)*		Cauc. (n=3110)*		Afr. Am (n=308)*		Cauc. (n=3076)*		Afr. Am (n=301)*		Cauc. (n=3126)*		Afr. Am (n=314)*		Cauc. (n=3001)*		Afr. Am (n=309)*		Cauc. (n=3067)*	
Block/Independent variable	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2	Reg. coeff.	Inc. in R^2
Intercept	8.04		8.19		8.11		10.46		8.88		11.15		12.03		13.44		9.97		11.02	
1: High school grade average in 4 core areas	3.07	.32	2.88	.28	2.50	.31	2.49	.32	3.32	.25	2.89	.23	2.05	.22	2.49	.26	2.92	.39	2.70	.34
2: Core courses taken		.10		.06		.15		.19		.06		.04		.07		.07		.11		.10
Algebra 2	1.95		.85		1.21		.65		--		--		--		--		1.43		.75	
Geometry	--		1.37		--		1.41		--		--		--		--		--		--	
Trigonometry	2.60		1.31		2.94		1.92		2.81		1.17		2.06		1.03		2.38		1.38	
Calculus	--		1.80		--		3.04		--		1.95		--		1.28		--		2.01	
Other Math beyond Algebra 2	--		.51		--		1.21		--		.82		--		.63		--		.79	
Chemistry	--		--		--		--		--		--		--		.76		--		--	
Physics	--		--		--		.85		--		--		--		.58		--		.44	
Geography	.87		--		--		--		1.20		--		--		--		--		--	
3: Education-related factors		.02		.05		.02		.03		.02		.07		.02		.03		.01		.05
College-prep curriculum	--		1.10		.85		.57		--		1.04		--		.77		--		.94	
Need help with math skills	--		--		-.66		-1.63		--		--		-.78		-.47		--		-.37	
Need help with reading	--		-1.84		--		--		-1.46		-2.66		--		-1.14		-.69		-1.44	
Need help with writing skills	-.98		--		--		--		--		--		--		--		--		--	
4: Activities				.01								.01		.01						.01
Educational activities	--		2.22		--		--		--		2.64		.68		--		--		1.60	
Quadratic term	--		-.72		--		--		--		-.75		--		--		--		-.48	
Homework	--		--		--		--		--		--		--		--		--		--	
Work for pay	--		-.10		--		--		--		--		--		--		--		--	
5: Background variables		.03		.01				.01				.01		.01		.01		.02		.02
Parents' level of education	.41		.31		--		.26		--		.37		--		.25		.23		.29	
Primary language spoken at home is English	--		--		--		--		--		--		--		--		--		--	
Pressure to participate in athletics	.42		--		--		--		--		--		-.29		--		--		--	
No. of negative situations	--		--		--		--		--		--		--		--		--		--	
8: Perception variables		.06		.01				.01		.03		.02				.02		.04		.02
Perception of self	-.88		--		--		--		--		--		--		--		-.49		--	
General health	-.84		-.78		--		-.49		-.74		-1.13		--		-.64		-.52		-.76	
General anxiety	-.12*	<.01	.42	<.01	-.45*	<.01	-1.03	.01	-.07*	<.01	.18*	<.01	.79	.01	-1.36	.02	-.44	<.01	-.45	<.01
10: Gender	.54		.43		.49		.58		.36		.39		.35		.43		.57		.54	
R^2	2.10		2.11		1.75		1.69		2.63		2.44		1.81		1.80		1.58		1.63	
SEE																				

* Unweighted n-counts

Note: Statistical significance for the African American models was set at $p < .05$; statistical significance was set at $p < .01$ for the Caucasian American models.
See Table 1 for variable coding.

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There were consistent differences between African American and Caucasian American students in the course work variables that contributed to explaining ACT performance. For all ACT scores, more courses were included in the regression models for Caucasian American students than for African American students. In addition, more upper-level mathematics and science courses were included in the Caucasian American models than the African American models. This finding could be attributed to two related factors: African American students had lower average high school grade averages than Caucasian American students (3.23 vs. 2.76), and smaller percentages of African American students took upper-level mathematics and science courses. For example, 21% of African American students had taken trigonometry, compared to 39% of Caucasian American students; 23% of African American students took another mathematics course after Algebra 2, compared to 31% of Caucasian American students.

The models within the two racial/ethnic groups showed a substantial reduction in the regression coefficients associated with gender, compared to the original total group gender models. For African Americans, gender was not statistically significant ($p > .05$) for all ACT tests except Science Reasoning. Consistent with the total group gender models, gender was not statistically significant ($p > .05$) for Reading for Caucasian Americans. However, Composite score gender differences were 21% smaller for Caucasian Americans than for the total group.

Discussion

The results of this study showed that about 50% to 65% of the variance in ACT scores could be explained by high school grade average; mathematics and science course work taken; enrollment in a college-preparatory curriculum and needs for help with reading, mathematics skills, and writing skills; time spent on educational activities and homework; parent's level of education and English as primary language in the home; perceived general anxiety; high school

attended; and race/ethnicity or gender. In comparison to earlier research (Noble, et al., 1992), the explained variance for this study was slightly higher (difference of 2% to 5%) for all ACT scores except Reading and Science Reasoning.

As was found in earlier research (Noble, et al., 1992; Noble & McNabb, 1989), the variables most strongly associated with ACT scores were high school course work, grade average, and high school attended. In particular, whether students had or had not taken specific mathematics or science courses appeared to result in sizeable mean ACT score differences. These findings were consistent for the total group, as well as for African American and Caucasian American students separately.

The findings for gender or race/ethnicity were clear: Over and above course work taken, grades earned, high school attended, and the other variables in the models, 2% or less of the variance in ACT scores was related to gender or race/ethnicity. Mean gender differences in Mathematics, Science Reasoning, and Composite scores were reduced slightly by including these variables in the models. In comparison, mean score differences between Hispanics/Native Americans and Caucasian Americans, and African American and Caucasian Americans, were reduced substantially by including these variables in the models.

The noncognitive variables contributed little to explaining ACT performance, relative to course work, grades, or high school attended. Of those variables that met the criteria for entry into the models, many were strongly related to course work and grades as well as to ACT scores (e.g., self-efficacy). With course work and grades included in the models, the noncognitive variables either did not explain additional variance in ACT scores, or were collinear with other variables in the models. For a discussion about the contributions of noncognitive variables to

explaining ACT performance, high school course work, and high school grade average, see ACT Research Report No. 99-4.

Implications

In order for students to achieve higher ACT scores and increase their likelihood of success in college, they need to take rigorous course work and achieve high grades in those courses. In particular, mathematics and science course taking appear to benefit students, regardless of the grades they receive. To some extent, their educational achievement can also benefit from time spent on education-related activities, such as reading or spending time at the library, as long as students engage in these activities in moderation.

This study showed that the majority of racial/ethnic differences in ACT performance can be explained by course work taken, grades earned, and the other variables included in the models. Gender differences were also explained by these variables, but to a lesser extent. Thus, further research needs to explore those factors related to gender differences in ACT scores, such as differences in grading practices between gender groups, and differences on other noncognitive factors such as motivation, study skills, and priorities. Moreover, additional analyses need to be conducted to determine the extent to which the remaining unexplained variance in ACT scores may be due to measurement error in the independent variables studied (e.g., reliability of course grades).

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Appendix A

Survey of ACT-tested Students

Survey of ACT-tested Students
October, 1996

Directions: Please respond to each item with the most appropriate answer(s). All responses will be kept strictly confidential and will be used only for research purposes. They will in no way affect your ACT Assessment scores. If you prefer not to respond to an item, simply leave it blank.

SECTION 1. From the list of reasons provided below, please identify your three most important reasons for attending college and write the corresponding letters in the blanks provided to the left. Write only *one* letter in each blank.

_____ 1. Most important reason.

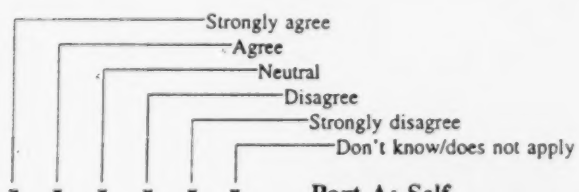
_____ 2. Second most important reason.

_____ 3. Third most important reason.

Reasons for attending college

a. To obtain skills and knowledge that will help me get a good job after I graduate.
b. To achieve social status or prestige.
c. To learn more about other cultures, philosophies, and peoples.
d. To participate in intercollegiate athletics (NCAA, NAIA, etc.)
e. To learn to be a responsible citizen.
f. To become more independent.
g. To join a fraternity/sorority.
h. To develop personal maturity.
i. To continue my religious training.
j. To more fully develop my social skills.
k. To meet new people.
l. To find a spouse/significant other.
m. To be exposed to new ideas.
n. To get away from my parents.
o. Can't find anything better to do after high school.
p. Other (please specify) _____

SECTION 2. Indicate your level of agreement with each statement by checking the appropriate response.



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Part A: Self

☐ ☐ ☐ ☐ ☐ ☐ 1. I'm easily intimidated by others.
☐ ☐ ☐ ☐ ☐ ☐ 2. I consider myself to be a leader.
☐ ☐ ☐ ☐ ☐ ☐ 3. Compared to other students my age, I rank in the top 20% in overall academic ability.
☐ ☐ ☐ ☐ ☐ ☐ 4. I am a confident and capable person.
☐ ☐ ☐ ☐ ☐ ☐ 5. I usually exercise regularly (walking, jogging, aerobics, etc.)
Please indicate number of times per week _____
☐ ☐ ☐ ☐ ☐ ☐ 6. I usually eat healthy and nutritious food.
☐ ☐ ☐ ☐ ☐ ☐ 7. I usually get enough sleep each night.
Please indicate number of hours of sleep you get per night _____
☐ ☐ ☐ ☐ ☐ ☐ 8. I feel stressed or anxious (for example, trembling hands, upset stomach, etc.) when taking tests like the ACT Assessment.
☐ ☐ ☐ ☐ ☐ ☐ 9. I worry about my personal security/safety at school.
☐ ☐ ☐ ☐ ☐ ☐ 10. I worry about my personal security/safety in my neighborhood.

SECTION 3. Estimate the average number of hours you spend per week on each type of activity listed below by checking the appropriate box.

Number of hours per week							
0	1-5	6-10	11-15	16-20	More than 20	Does not apply	Activity
☐	☐	☐	☐	☐	☐	☐	1. Doing homework/studying outside of class time
☐	☐	☐	☐	☐	☐	☐	2. Taking college courses
☐	☐	☐	☐	☐	☐	☐	3. Participating in community sports (outside of school)
☐	☐	☐	☐	☐	☐	☐	4. Using recreational/social facilities in my community (community center, recreation center, YMCA/YWCA, etc.)
☐	☐	☐	☐	☐	☐	☐	5. Using educational facilities in my community (public library, zoo, museum, etc.)
☐	☐	☐	☐	☐	☐	☐	6. Participating in community organizations and clubs (Boy/Girl Scouts, 4-H Club, etc.)
☐	☐	☐	☐	☐	☐	☐	7. Spending time with friends
☐	☐	☐	☐	☐	☐	☐	8. Working at a job for pay
☐	☐	☐	☐	☐	☐	☐	9. Participating in family activities (e.g., caring for younger siblings)
☐	☐	☐	☐	☐	☐	☐	10. Reading for fun (does not include school assignments)
☐	☐	☐	☐	☐	☐	☐	11. Using a computer at home
☐	☐	☐	☐	☐	☐	☐	12. Watching TV
☐	☐	☐	☐	☐	☐	☐	13. Performing volunteer work (please specify) _____
☐	☐	☐	☐	☐	☐	☐	14. Participating in school-related extracurricular activities (athletics, organizations)
☐	☐	☐	☐	☐	☐	☐	15. Attending cultural events outside of school hours such as theater, music and exhibits—not TV or sports events
☐	☐	☐	☐	☐	☐	☐	16. Attending or participating in church/religion-related activities
☐	☐	☐	☐	☐	☐	☐	17. Other (please specify) _____

SECTION 4. Please respond to this section *only* if you have taken or are currently taking advanced, honors, or accelerated courses.

For the courses listed below, please indicate the courses you have taken or are currently taking as *advanced, honors, or accelerated courses* by checking the appropriate box(es).

Taken/Taking as Advanced, Honors, or Accelerated Courses

English
- ☐ 1. English 9
- ☐ 2. English 10
- ☐ 3. English 11
- ☐ 4. English 12
- ☐ 5. Speech

Mathematics
- ☐ 1. Algebra I
- ☐ 2. Algebra II
- ☐ 3. Geometry
- ☐ 4. Trigonometry
- ☐ 5. Calculus
- ☐ 6. Other Math beyond Algebra II
- ☐ 7. Computer Math/ Computer Science

Science
- ☐ 1. General/Physical/ Earth Science
- ☐ 2. Biology
- ☐ 3. Chemistry
- ☐ 4. Physics

SECTION 5. How many individuals live with you in your home, by age category (not including yourself)?

_____ Under age 13 _____ Between ages 13-20 _____ Between ages 21-65 _____ Over age 65

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SECTION 6. What is the highest level of education completed by your parents/guardians? Please complete Column A and Column B.

Column A. Father/Male guardian (check one)	Level of education	Column B. Mother/Female guardian (check one)
☐	1. Less than high school diploma or GED equivalent	☐
☐	2. High school diploma or GED equivalent	☐
☐	3. Some college-level work completed, no degree/certificate	☐
☐	4. Vocational/technical program certificate or diploma	☐
☐	5. Associate's degree (2-year program)	☐
☐	6. Bachelor's degree	☐
☐	7. Master's degree (MS, MA, MBA)	☐
☐	8. Doctoral or Professional degree (PhD, MD, JD, EdD)	☐
☐	9. Other	☐

SECTION 7. Please respond to each item by checking the appropriate box.

Yes	Uncertain	No	Item
			Part A: I...
☐	☐	☐	1. ...have moved to a different home three or more times within the last two years.
☐	☐	☐	2. ...will be the first person in my immediate family (including parents) to graduate from high school.
☐	☐	☐	3. ...will be the first person in my immediate family (including parents) to attend college.
☐	☐	☐	4. ...have a chronic health problem or serious physical illness.
☐	☐	☐	5. ...work to help pay for my family's living expenses (rent, food, etc.).
☐	☐	☐	6. ...work to help pay for my college education.
			Part B: Someone in my immediate family...
☐	☐	☐	1. ...has a chronic health problem or serious physical illness.
☐	☐	☐	2. ...has died in the past two years.
☐	☐	☐	3. ...has divorced or separated in the past two years.
☐	☐	☐	4. ...has been unemployed for two months or longer in the past two years.

SECTION 8. Please describe below any other activities or conditions in your home, school, or community that you think affect your ability to do well in school.

* * * THANK YOU FOR COMPLETING THIS SURVEY * * *
PLEASE RETURN YOUR COMPLETED SURVEY TO ACT

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Appendix B

Weighted Descriptive Statistics for All Variables in the Full Models

Block/Independent variable	English (unweighted n = 3928)				Mathematics (unweighted n = 3864)				Reading (unweighted n = 3924)				Science Reasoning (unweighted n = 3857)				Composite (unweighted n = 3849)			
	Mean	SD	%*	r	Mean	SD	%*	r	Mean	SD	%*	r	Mean	SD	%*	r	Mean	SD	%*	r
1: High school GPA in 4 core areas	3.19	.34		.56	3.20	.34		.60	3.19	.34		.50	3.19	.34		.54	3.20	.34		.61
2: Core courses taken (1=yes, 0=no)																				
Algebra 2			62	.28			61	.31			62	.24			---	---			61	.31
Geometry			68	.20			67	.22			---	---			67	.18			67	.20
Trigonometry			27	.36			27	.50			27	.31			26	.38			26	.43
Calculus			6	.25			6	.38			6	.23			6	.26			6	.31
Other Math beyond Algebra 2			21	.24			21	.34			21	.22			21	.24			21	.29
Chemistry			---	---			---	---			---	---			56	.26			---	---
Physics			---	---			19	.34			---	---			19	.25			19	.28
3: Education-related factors																				
College-prep. curr. (1=yes, 0=no)			55	.27			54	.26			55	.24			54	.24			54	.29
Need help with math skills (0=yes, 1=no)			---	---			26	-.42			---	---			27	-.31			---	---
			22	-.24			---	---			22	-.28			21	-.18			21	-.22
Need help with reading (0=yes, 1=no)			18	-.21			---	---			---	---			---	---			18	-.19
Need help with writing skills (0=yes, 1=no)																				
4: Activities (hours per week, 0-5)																				
Educational activities	.77	.28		.12	---	---		---	.77	.28		.14			---	---	.77	.28		.13
Homework activities	---	---		---	---	---		---	1.99	.64		.13			---	---	---	---	---	---
5: Background variables																				
Parents' level of education (1-8)	4.12	1.0	69	.31	4.13	1.00		.31	4.12	1.00	69	.29	4.13	1.00	67	.30	4.13	1.0	67	.34
Primary language at home is English (1=yes, 0=no)				.11	---	---		---				.11				.08		0		.09
8: Perception variables (1-5)																				
Perception of self																				
General anxiety	2.30	.49		-.29	2.29	.49		-.26	2.30	.49		-.31	2.29	.49		-.30	2.29	.49		-.33

* Values in the percent columns indicate the percentage of all students who responded affirmatively to a dichotomous item (e.g. have taken Algebra = 1; have not = 0).

Notes: All of the variables listed above meet the criteria for inclusion in the models ($p < .01$, zero-order $r >= .10$), based on the overall sample of 5,489 students.
Some correlations reported above may be less than .10, due to the smaller sample sizes for the full models.
See Table 1 for variable coding.